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# The Impact of a Pan-Canadian Carbon Pricing Levy on PBO's GDP Projection

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The Parliamentary Budget Officer (PBO) supports Parliament by providing analysis, including analysis of macro-economic and fiscal policy, for the purposes of raising the quality of parliamentary debate and promoting greater budget transparency and accountability.

This report provides additional detail related to the economic impact of the carbon pricing levy presented in PBO's April 2018 Economic and Fiscal Outlook.

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# Glossary

| | |
|---|---|
| **ECCC** | Environment and Climate Change Canada, Government of Canada |
| **Ecofiscal Commission** | Canada's Ecofiscal Commission, Montreal |
| **EFO** | Economic and Fiscal Outlook, Parliamentary Budget Officer |
| **OBPS** | Output-based Pricing System |
| **PBO** | Parliamentary Budget Officer |
| **PCF** | Pan-Canadian Framework on Clean Growth and Climate Change |

# Executive Summary

Consistent with its legislated mandate, PBO prepares medium-term economic and fiscal projections on a regular basis. Over the course of the year, we update our projections to reflect economic and fiscal developments, as well as policy initiatives. In PBO's April 2018 Economic and Fiscal Outlook (EFO), we incorporated the economic impact of a carbon pricing levy, rising to $50 per tonne in 2022, that would apply over our medium-term projection horizon.

With the implementation of a Canada-wide carbon pricing levy rising from $10 per tonne of $CO_2$ equivalent in 2018 to $50 per tonne in 2022, we projected that real GDP would be 0.5 per cent ($10 billion) lower in 2022 compared to a scenario without the carbon pricing levy. PBO's GDP impact was based, in large part, on analysis conducted by the Ecofiscal Commission in 2016.

**PBO carbon pricing levy scenarios**

PBO's GDP impact was expressed relative to a scenario in which carbon pricing does not take place. Under this hypothetical "counterfactual" scenario, there is no carbon pricing levy, either at the federal level or at the provincial-territorial level. The rationale for using a no-carbon-pricing scenario was to show the impact that a carbon pricing levy would have on our economic projection given that we did not account for it in our previous EFO.

The carbon pricing levy we incorporated into our EFO projection was the profile set under the federal carbon pricing backstop. Under the federal backstop, carbon levy rates will initially be set for the period from 2018 to 2022 such that they are equivalent to $10 per tonne in 2018 and increase by $10 per tonne annually to $50 per tonne in 2022. Consistent with the federal carbon backstop, PBO's carbon pricing levy was not applied to all emissions.

**Key assumptions and adjustments**

Based on our assessment of current policy trends at the provincial level, we chose to analyse the carbon pricing levy *as if* the revenues generated from the levy would be returned through provincial and territorial governments to households as lump-sum payments. We judged that this assumption was the most appropriate for our projection and provided references to provincial programs to highlight the relatively high-cost recycling policies currently in place.

Further, in our April EFO, we specifically highlighted the fact that "were provinces and territories to undertake more efficient revenue recycling, such as reducing corporate or personal income taxes, the impact of the carbon

pricing levy on the Canadian economy would be significantly lower". Indeed, we explicitly cited Ecofiscal Commission's (2016) result stating that "recycling carbon revenues by reducing corporate income taxes would essentially offset the impact of the carbon levy on the Canadian economy in 2022".

To map Ecofiscal Commission's own scenarios for GDP impacts of carbon pricing into PBO's scenario, several adjustments were required. Those adjustments make the results consistent with the levy in the federal carbon pricing backstop. As indicated in our report, we will continue to monitor carbon pricing and will adjust our assumptions accordingly.

**PBO and Environment and Climate Change Canada's estimated impacts**

Our estimate of the impact of a Canada-wide carbon pricing levy—consistent with the levy under the federal backstop—on real GDP in 2022 of -0.50 per cent is broadly in line with Environment and Climate Change Canada's (ECCC) estimated impact of measures under the Pan-Canadian Framework published in 2016. ECCC estimated that measures under the PCF, including carbon pricing but excluding infrastructure investments and technology incentives, would reduce the level of GDP by 0.35 per cent in 2022.

While PBO's estimate is based on coverage of 70 per cent of emissions, consistent with the levy under the federal backstop, ECCC's estimate covers a broader source of emissions. However, ECCC's estimated impact is expressed relative to their 2016 reference scenario that already included the effects of significant policies at the provincial level (e.g., British Columbia's carbon price levy, Ontario and Quebec's cap-and-trade systems, Alberta's policy, etc.). Those provincial policies were not included in PBO's counterfactual scenario. If ECCC's reference scenario was adjusted to remove those policies, their estimated GDP impact would be larger in absolute terms (i.e., more negative) than their reported estimate of -0.35 per cent.

# 1. Introduction

Consistent with its legislated mandate, PBO prepares medium-term economic and fiscal projections on a regular basis. Over the course of the year, we update our projections to reflect economic and fiscal developments, including policy initiatives.

In PBO's April 2018 Economic and Fiscal Outlook (EFO)[1], we incorporated the economic impact of a carbon pricing levy. The manner in which that levy was implemented in the analysis makes it comparable to the core part of the Pan-Canadian Framework (PCF) on Clean Growth and Climate Change: the federal carbon pricing backstop.

As noted in the December 2017 First Annual Synthesis Report, "[t]he Pan-Canadian Framework is built on four pillars: pricing carbon pollution, complementary actions to reduce emissions across the economy, adaptation and climate resilience, and clean technology, innovation, and jobs".

The main economic impacts of the PCF will come from: (1) the carbon pricing levy, which will act to put a price on emissions; (2) an output-based pricing system (OBPS), which will apply to large emitters (between 20 and 30 per cent of emissions); and (3) a series of regulatory changes.[2] PBO's analysis only accounted for a Canada-wide carbon pricing levy.

PBO did not attempt to provide a comprehensive assessment of the economic (or environmental) impacts of the PCF. Rather, we judged that the scheduled increase in the federal carbon price levy, and the requirement that provincial and territorial programs be equivalent to that, is significant enough that it should not be ignored in constructing medium-term economic and fiscal projections.

The key aspect of PBO's work is that the carbon pricing levy will be $50 per tonne across all provinces and territories in 2022. This allows us to avoid distinguishing between provincial-territorial and federal actions since the source of the levy should be irrelevant for measuring the GDP impact, conditional on revenue recycling being similar irrespective of government jurisdiction.

With the carbon pricing levy rising from $10 per tonne of $CO_2$ equivalent in 2018 to $50 per tonne in 2022, compared to a scenario without a carbon pricing levy, we projected that Canada's real GDP would be 0.5 per cent ($10 billion) lower in 2022—assuming all provinces and territories have that same carbon pricing levy. PBO's GDP impact was based, in large part, on analysis conducted by the Ecofiscal Commission in 2016.[3]

The following provides additional detail related to the economic impact of the carbon pricing levy presented in PBO's April 2018 EFO.

# 2. PBO's carbon pricing levy scenarios

PBO's GDP impact was expressed relative to a scenario in which carbon pricing does not take place. Under this hypothetical "counterfactual" scenario, there is no carbon pricing levy, either at the federal level or at the provincial-territorial level (Table 1).

Next, we considered a scenario in which a carbon pricing levy is imposed across Canada, rising from $10 per tonne in 2018 to $50 per tonne in 2022 in all provinces and territories and covering 70 per cent of emissions.

## Table 1 PBO carbon pricing levy scenarios

| $ per tonne of $CO_2$ equivalent | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| **Hypothetical counterfactual (no carbon pricing levy)** | 0 | 0 | 0 | 0 | 0 |
| **Canada-wide carbon pricing levy** | 10 | 20 | 30 | 40 | 50 |

Source: Parliamentary Budget Officer.

Consequently, our impact does not reflect the fact that several provinces (British Columbia, Alberta, Ontario and Quebec) already have carbon pricing systems in place. Further, our analysis does not estimate the impact of the PCF, rather it accounts for a carbon pricing levy, as per the federal backstop.

This contrasts with recent analysis by Environment and Climate Change Canada (ECCC) that estimated the impact of applying federal carbon pricing to the remaining nine jurisdictions (six provinces and three territories) that are not currently pricing carbon.[4] The Department's analysis finds that:

> Between 2018 and 2022, the application of the federal carbon pollution pricing system in the nine jurisdictions that do not currently have their own regimes in place is estimated to impact average annual real GDP growth rates for Canada by less than one tenth of one percentage point. The difference in GDP in 2022 would amount to about $2 billion, or 0.1% of GDP.

In addition, given that the nine jurisdictions represented in that study account for a disproportionately small share of Canada's population, emissions, and GDP, ECCC's estimated GDP impact (-0.1 per cent in 2022) is smaller in magnitude compared to PBO's impact (-0.5 per cent in 2022).

On the other hand, an earlier study by ECCC also reported the results of a $50 per tonne carbon pricing levy in 2022 that was applied uniformly across Canada (and included other measures for sectors not covered by the carbon levy).[5] In that case, the GDP impact was estimated to be -0.35 per cent in 2022. This result covers a broader range of emission sources than are covered in PBO's analysis, but ECCC's estimated impact was expressed relative to their 2016 reference scenario that already included the effects of significant carbon policies at the provincial level (e.g., British Columbia's carbon price levy, Ontario and Quebec's cap-and-trade systems, Alberta's policy, etc.). Those polices were not accounted for in PBO's counterfactual scenario. If ECCC's reference scenario was adjusted to remove these polices, their estimated GDP impact would be larger in absolute terms (i.e., more negative) than its reported estimate of -0.35 per cent.

The rationale for PBO using a no-carbon-pricing scenario was to show the impact that a carbon pricing levy (using the federal levy as a reference) would have on our economic projection given that we did not account for it in our previous EFO.

# 3. Ecofiscal Commission (2016) economic impact estimates

Analysis prepared by the Ecofiscal Commission in 2016 provided estimates of the impact on average annual GDP growth over 2015 to 2032 of an economy-wide carbon price rising from $30 per tonne in 2015 to an ultimate level of $100 per tonne (in 2015 dollars) in 2027.

Their analysis was focused on providing alternative scenarios regarding how the revenue raised by carbon pricing would flow back to households and businesses. Ecofiscal Commission's 2016 report concluded by providing provincial governments with guidance regarding revenue recycling options and their trade-offs.

Their estimated impacts were expressed relative to a scenario in which carbon pricing does not take place, except for British Columbia's carbon price of $30 per tonne. It was applied to roughly 90 per cent of all sources of GHG emissions.

Table 2 details Ecofiscal Commission's estimates expressed in terms of the impact on the level of real GDP of carbon prices rising from $30 per tonne in 2015 to $100 per tonne in constant dollars ($140 per tonne in current dollars) by 2032.[6]

## Table 2 Ecofiscal Commission (2016) estimates of GDP impacts of carbon pricing under alternative recycling approaches

| | 2020 | 2026 | 2032 |
|---|---|---|---|
| **Carbon prices (dollars)** | | | |
| Carbon price per tonne (constant dollars) | 30.00 | 50.00 | 100.00 |
| Carbon price per tonne (current dollars) | 33.12 | 62.17 | 140.02 |
| **Impact on the level of real GDP (per cent)** | | | |
| Lump-sum payments to households | -0.57 | -1.05 | -1.96 |
| Personal income tax reductions | -0.45 | -0.88 | -1.72 |
| Investments in clean technology | -0.14 | -0.30 | -0.59 |
| Transitional support to industry | -0.11 | -0.23 | -0.56 |
| Corporate income tax reductions | -0.06 | -0.10 | -0.23 |

Sources: Ecofiscal Commission and Parliamentary Budget Officer.

Note: Estimates of the carbon price per tonne in current dollars are based on PBO's assumption of 2.0 per cent annual inflation.

The presentation of these results is entirely consistent—and is taken from—results presented in Table 6 (page 27) of Ecofiscal Commission's 2016 report. The key difference is the calculation of the impacts: the difference in average annual real GDP *growth* rates versus the impact on the *level* of real GDP in a given year expressed in percentage terms. Indeed, Ecofiscal Commission (2016) notes that "a sustained difference in growth rates of just 0.05 [percentage points] per year leads to a difference in the level of GDP after 17 years of just 1.2%; so the negative impact of carbon pricing is noticeable, but very small".

In PBO's report, we expressed the impact as the percentage difference between the level of GDP in 2022 under the lump-sum payment scenario and our scenario with no carbon pricing levy. This is consistent with how we have presented GDP impact estimates in previous reports (e.g., impacts of oil price shocks, impacts of infrastructure spending, impacts of changes in U.S. fiscal policy etc.), and with impact estimates from other organizations that produce economic and fiscal projections.

The level of real GDP is typically used in representing impact estimates given that it represents the broadest measure of economic activity and figures prominently in conventional measures of living standards (i.e., the level of real GDP per person).

Figure 3 in our EFO shows the $10 billion difference in the projected increase in GDP under our two scenarios, which is also equivalent to the difference between the levels of GDP in 2022 under the same two scenarios (it is just not expressed in percentage terms). We presented the chart in this manner

to try to avoid potential confusion that real GDP would decline relative to its current level in 2017 under a carbon pricing levy.

# 4. PBO's revenue recycling assumption

Based on our assessment of current policy trends at the provincial level, we chose to analyse a carbon price levy *as if* the revenues generated from the levy would be returned through provincial and territorial governments to households as lump-sum payments. Consequently, our assumption corresponds to the "highest cost" scenario among the subset of scenarios considered by Ecofiscal Commission.

To emphasize, the 2016 Ecofiscal Commission report was prescriptive in illustrating how to minimise cost. The lesson from that work was that reducing corporate income taxes would have been the preferred choice if minimising the economic impact of carbon pricing was a priority. That policies announced since the publication of Ecofiscal's report have not emphasized reductions in corporate and personal income taxes signals that other priorities have been preferred.

We thus judged that a scenario under which carbon pricing revenues were being rebated back to households as lump-sum payments was the most appropriate for our projection. In our April EFO, we provided references to provincial programs to highlight the relatively high-cost recycling policies currently in place. For example, British Columbia's approach had initially been revenue neutral but in its most recent budget, planned increases in carbon taxes no longer have to be offset by reductions in other taxes.[7]

Even in cases where provincial spending is explicitly targeted for addressing climate change, the implicit carbon levy can be exceptionally high. For example, in the case of Ontario's plug-in vehicle subsidy of $5000 per car, the implicit carbon price for a vehicle like the Prius Prime would be about $125 per tonne, or higher, depending on how that vehicle was used (based on avoided emissions over lifetime use). This would be on top of the carbon levy already applied on gasoline.

Further, we felt that using the lump-sum payment assumption was the most "balanced" for our national projection. Some future provincial actions might be more, and some might be less, efficient than lump-sum recycling. As we noted in our report, we will continue to monitor this and update our assumptions accordingly.

Lastly, in our report, we specifically highlighted the fact that "were provinces and territories to undertake more efficient revenue recycling, such as reducing corporate or personal income taxes, the impact of the carbon pricing levy on the Canadian economy would be significantly lower". Indeed, we explicitly cited Ecofiscal Commission's (2016) result stating that "recycling carbon revenues by reducing corporate income taxes would essentially offset the impact of the carbon levy on the Canadian economy in 2022".

# 5. Adjusting Ecofiscal's GDP impact estimate

The Ecofiscal Commission's estimate of the GDP impact of carbon pricing (under lump-sum recycling) was used for our scenario that contrasts no carbon pricing with a carbon pricing levy consistent with the levy under the federal carbon pricing backstop.

Underpinning PBO's use of Ecofiscal Commission's analysis is a proportionality in their results.[8] That is, even if Ecofiscal Commission did not undertake a simulation with a carbon pricing levy as outlined in the federal backstop, we can infer what their model would give for a carbon pricing levy under the PCF by looking at their results for other carbon levies.

In terms of our adjustments, we first attempted tc adjust for the inclusion of British Columbia's carbon price of $30 per tonne in Ecofiscal Commission's baseline scenario.[9] Without making this adjustment, using Ecofiscal Commission's estimate would understate the impact of moving from a scenario with no carbon pricing to one with a carbon pricing levy.

Next, given the differences in the profiles of carbon prices in our scenarios, we tried various approaches to scale Ecofiscal Commission's impacts to line up with a carbon price levy rising from $10 per tonne in 2018 to $50 per tonne (in current dollars) in 2022.[10] However, there did not appear to be a unique approach to adjust for these differences. Consequently, we examined several calculations resulting in impacts ranging from, for example, -0.65 per cent to -0.92 per cent on the level of real GDP in 2022.[11]

Given that Ecofiscal Commission's analysis was based on a broad coverage (90 per cent) of GHG emissions sources, while the carbon pricing levy under the federal backstop is narrower in scope, our calculated impacts need to be reduced in absolute terms (i.e., less negative). Since there does not appear to be a precise estimate of the emissions coverage under the backstop, an assumption of 70 per cent emissions coverage reduces our calculations to

range from -0.51 per cent and -0.72 per cent on the level of real GDP in 2022.[12]

Further, the 20 to 30 per cent of emissions not covered by a carbon pricing levy in our scenario would be addressed through other measures under the PCF (particularly the OBPS). This is combined with the enhanced costs imposed on some emissions through regulations that apply to areas already covered by the levy, and even OBPS. Consequently, the overall GDP impact of carbon pricing under the PCF, relative to a scenario without carbon pricing, would be larger in magnitude than PBO's estimated impact.

# 6. Conclusion

Ultimately, in constructing our April outlook, we incorporated an impact of -0.50 per cent ($10 billion) on the level of real GDP in 2022 and simply imposed a linear transition path from an initial impact of -0.10 per cent in 2018. As indicated in our report, we will continue to monitor carbon pricing and will adjust our assumptions accordingly.

Our estimate of the impact of a Canada-wide carbon pricing levy—consistent with the levy under the federal carbon pricing backstop—is broadly in line with Environment and Climate Change Canada's (ECCC) estimated impact of measures under the Pan-Canadian Framework published in 2016. ECCC estimated that measures under the PCF, including carbon pricing but excluding infrastructure investments and technology incentives, would reduce the level of GDP by 0.35 per cent in 2022.

While PBO's estimate is based on coverage of 70 per cent of emissions, consistent with the levy under the federal backstop, ECCC's estimate covers a broader source of emissions. However, ECCC's estimated impact is expressed relative to their 2016 reference scenario that already included the effects of significant policies at the provincial level (e.g., British Columbia's carbon price levy, Ontario and Quebec's cap-and-trade systems, Alberta's policy, etc.). Those provincial policies were not included in PBO's counterfactual scenario. If ECCC's reference scenario was adjusted to remove those policies, their estimated GDP impact would be larger in absolute terms (i.e., more negative) than their reported estimate of -0.35 per cent.

# Notes

1. Available at: http://www.pbo-dpb.gc.ca/web/default/files/Documents/Reports/2018/EFO%20April%202018/EFO_April%202018_EN.pdf.
2. For the complementary measures (e.g., regulatory actions) see, www.canada.ca/en/services/environment/weather/climatechange/climate-action/federal-actions-clean-growth-economy.html).
3. Ecofiscal Commission (2016), *Choose Wisely: Options and Trade-offs in Recycling Carbon Pricing Revenues*, Ottawa, April. Available at: https://ecofiscal.ca/reports/choose-wisely-options-trade-offs-recycling-carbon-pricing-revenues/.
4. See *Estimated impacts of the Federal Carbon Pollution Pricing System* available at: https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/pricing-carbon-pollution/estimated-impacts-federal-system.html.
5. See *Economic Analysis of the Pan-Canadian Framework* available at: https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/economic-analysis.html.
6. Ecofiscal Commission provided PBO with the annual real GDP levels for 2014, 2020, 2026 and 2032. Ecofiscal Commission's model simulations run in 6-year time steps.
7. See: http://bcbudget.gov.bc.ca/2018/bfp/2018_Budget_and_Fiscal_Plan.pdf#page=82.

   Alberta's plan will return less than half of the revenues as rebates with the remaining going to green spending and infrastructure. See: https://www.alberta.ca/climate-carbon-pricing.aspx#p184s4. Only a small portion will go to corporate tax reduction, though large emitters will be required to meet output-based performance standards and not be charged for emissions that meet them.

   Ontario will grant (some) free emission permits to participating firms, which will be reduced over time. The revenue from its auction of remaining permits will be put aside and spent on measures to reduce greenhouse gas emissions or compliance costs. See: https://www.ontario.ca/laws/statute/16c07#BK80.

   In Quebec, all revenues are spent through a Green Fund that is to finance actions to fight climate change. See: http://www.mddelcc.gouv.qc.ca/changementsclimatiques/plan-action-fonds-vert-en.asp.
8. The proportionality can be seen in the results illustrated for various levels of the carbon price levy (Table 2). More specifically, for the incremental levy.

The first levy is at $30, followed by an incremental levy of $20, followed by a final increment of $50. In each case, the incremental GDP loss is proportionally similar over the six-year period. Enough so that it allows PBO to use the results of the Ecofiscal Commission analysis to make inferences regarding the results of other carbon levies. Proportionality is particularly evident in the lump-sum revenue recycling scenario.

9. Based on a carbon price of $30 per tonne and given British Columbia's share of emissions in Canada (8.5 per cent), this requires adjusting Ecofiscal Commission's price scenario by $2.55 per tonne (approximately) to reflect the national impact relative to a no-carbon-pricing scenario.

10. In terms of the time horizons and implementation of carbon pricing scenarios, the year 2015 in Ecofiscal Commission's model simulations (i.e., the first year of the policy change) corresponds to 2018 in PBO's projection horizon.

11. The calculation of -0.65 per cent corresponds to the Ecofiscal GDP impact (under lump-sum recycling) of -0.57 per cent in 2020 (shown in Table 2) scaled by 31.72/27.57. This ratio represents the average constant dollar federal carbon price levy over 2018 to 2023 (assuming $50 per tonne in 2023), relative to the average constant dollar carbon price in Ecofiscal Commission's scenario over 2015 to 2020, adjusted for British Columbia's carbon tax.

    The calculation of -0.92 per cent corresponds to the Ecofiscal GDP impact (under lump-sum recycling) of -1.96 per cent in 2032 (shown in Table 2) scaled by 46.19/98.18. This ratio represents the constant dollar federal carbon price levy in 2022 relative to the constant dollar carbon price in Ecofiscal Commission's scenario in 2032, adjusted for British Columbia's carbon tax.

12. Since Ecofiscal Commission's results were based on coverage of 90 per cent of total emissions, and assuming that coverage is 70 per cent of total emissions under the federal backstop levy, our calculations (-0.65 and -0.92) need to be reduced by a factor of 0.78 (i.e., 0.7 divided by 0.9).